

## Karnal Bunt: A Fungal Disease of Wheat

Karnal bunt, or partial bunt, is a minor fungal disease of wheat, durum wheat, and triticale (a hybrid of wheat and rye). Typically, only a portion of the kernel is affected; this is why the disease is sometimes called partial bunt. Climatic conditions determine the extent of the disease. The disease primarily affects the quality of the grain itself.

The U.S. Department of Agriculture (USDA) regulates wheat infected with Karnal bunt, restricts the wheat's movement to specifically retain export markets that consider Karnal bunt a pest of quarantine significance, and keeps the fungus from spreading. Karnal bunt positive wheat can, however, be sent to approved facilities where it is cubed or steam rolled, a form of heat treatment, and sold as animal feed.

### History

The disease was first reported in 1931 in wheat-growing areas near the city of Karnal in the Indian State of Haryana. Since then, it has been found in all major wheat-growing States of India, as well as in Pakistan, Iraq, Afghanistan, and a small area in South Africa. The disease has been well established in some areas in northwestern Mexico since 1982. Federal regulations prohibit entry into the United States of seeds, plants, unprocessed straw, chaff, and products of the milling process (other than flour) of wheat from countries where Karnal bunt is known to occur. These commodities can enter only with a USDA permit for scientific purposes.

Karnal bunt was first confirmed in the United States in Arizona on March 8, 1996. Soon after that initial discovery, the fungus was also found in parts of Texas and California. In 2001, APHIS regulated Archer, Baylor, Throckmorton, and Young counties in Texas due to the detection of Karnal bunt in portions of each county. This was the first time the fungus has been detected outside of regulated areas.

In October 2002, USDA's Animal and Plant Health Inspection Service (APHIS) Plant Protection and Quarantine (PPQ) program modified its Karnal bunt regulations. PPQ removed regulated areas in Arizona, New Mexico, and Texas, including 420,261 acres in Archer, Baylor, Throckmorton, and Young counties. This reduction of the regulated area took place for one of several reasons including: completed detection and delimiting surveys showed these

areas to be free of Karnal bunt; they have not been used to produce Karnal bunt host crops within the last 5 years; or they produced Karnal bunt host crops in 1 or more years following initial regulation and the crops were tested and found free of the disease.

Today, APHIS regulates areas in the following counties: Riverside County in California; La Paz, Maricopa, and Pinal counties in Arizona; Archer, Baylor, Knox, San Saba, Throckmorton, and Young counties in Texas for Karnal bunt.

### Impact

Although the overall crop losses caused by Karnal bunt are not known to be severe, the disease has quarantine significance and thus impacts grain exports of countries with areas regulated for the disease. The United States is the world's leading wheat exporter, accounting for nearly one-third of world wheat exports.

### Detection

The disease cannot be easily detected in plants growing in the field: the grain must be removed from the head and examined. In addition, four other diseases can be mistaken for Karnal bunt: black point, common bunt, dwarf bunt of wheat, and a bunt of rye weed commonly present in wheat fields.

When checking crops for Karnal bunt, wheat growers should look for bunted kernels that are fragile, dark in color, and fishy smelling. The kernel usually remains whole, although part of the germ may be eroded. Cracks in the surface reveal a black powdery spore mass within the endosperm at the embryo end of the kernel or along the kernel groove.



### Symptoms of Karnal Bunt (*Tilletia indica*) Infection on Wheat Seed.

1. Healthy wheat seed.
2. "Tip" infection.
3. More advanced tip infection.
4. Advanced infection.
5. "Canoe" symptom hollowing out interior of seed.

Any kernels that show signs of contamination should be placed in a plastic bag within a sturdy container and taken to the nearest State regulatory official or to an APHIS field office. For general information about this process, or to identify your local contacts, please call 1-888-661-8083. To reach a PPQ field office in States within Karnal bunt-regulated areas, please call one of the following:

Olney, TX: (940) 564-4192

San Saba, TX: (915) 372-6276

Arizona: (602) 431-8930

California: (323) 881-6512

## How It Spreads

Karnal bunt is spread mainly by the planting of infected seeds. Infection occurs during the flowering stage of the host plant, when its developing ovary comes into contact with infectious sporidia, a stage in the lifecycle of the pathogen *Tilletia indica*. The ideal conditions for infection are cool weather, rainfall, and high humidity at the time of heading of wheat.

## Survey Work

USDA's Karnal Bunt National Survey provides information to support the Karnal bunt-free status of grain exports from the United States. Grain samples are taken in alternating years from every county in the United States that produces 1 million or more bushels of wheat. Participation is voluntary and grain elevators throughout every State that produces wheat provide the samples.

APHIS and/or State cooperators, collect a 4-pound composite wheat sample from county elevators after harvest. The samples are then sent to an approved laboratory and tested for bunted kernels. If a suspect kernel is found, a spore test for *Tilletia indica* is conducted which either eliminates or verifies the presence of Karnal bunt. The bunted kernel specimen and appropriate microscope slide with teliospores is sent overnight to the PPQ National Identifier.

In 2003, more than 1,300 grain samples from 33 States were collected and tested as part of the National Karnal Bunt Survey. All results were negative.

## Compensation

Every year since the harvest of 1996, when the first outbreak of Karnal bunt was discovered in the United States, APHIS has compensated producers affected by the fungus. This does not include the 1998-1999 crop season, because no wheat grown in the regulated areas tested positive for the disease.

In May 2002, APHIS amended its regulations in order to compensate certain growers and handlers of grain and seed affected by Karnal bunt who were not eligible for compensation under the 2001 rule. This amended rule also provided compensation for wheat

grown in States not covered by a Declaration of Extraordinary Emergency that was comingled with Karnal bunt positive wheat while in storage in Texas.

The levels of compensation depend on whether the grain came from an area that is newly regulated for Karnal bunt or an area that has been previously regulated for the fungus.

Compensation will be made available when a new outbreak of Karnal bunt is detected after the crop has already been planted, in instances where an extraordinary emergency is declared, an emergency action notification is issued after the crop has already been planted, or at the time it is sold. Producers who plant wheat in previously regulated areas after the 2000-2001 season will not be compensated.

APHIS must publish regulations in the *Federal Register* before offering compensation to farmers. Once the compensation rate is determined and the final rule is published, APHIS makes every effort to ensure affected producers, grain handlers, and seed companies are compensated as quickly as possible.

## Rapid Response

In October 2003, APHIS held the third Karnal Bunt Workshop in Oklahoma City, OK, to bring stakeholders and cooperators together to update the Karnal Bunt Strategic Framework, discuss the year's harvest, and make any changes to protocols before the 2004 wheat harvest.

## Additional Information

To learn more about Karnal bunt or to report a suspected outbreak, please contact:

USDA-APHIS-PPQ

1-888-661-8083

Pest Detection and Management Programs

4700 River Road, Unit 134

Riverdale, MD 20737-1236

(301) 734-4387

Karnal bunt information is also available on the APHIS Web site at

[www.aphis.usda.gov/ppq/emergencyprograms](http://www.aphis.usda.gov/ppq/emergencyprograms).

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